for some crops, especially potatoes, in cases of a deficient supply of potash in the soil, they have sometimes proved invaluable. In general, however, cost and efficiency are closely associated, and as plants and animals are almost alike in their chemical composition the same rule as to the value of their constituents holds good. You may purchase starch and the carbo-hydrates at a much lower rate than the nitrogenous substances in food. Turnips, bread fruit, and bananas, consisting chiefly of carbo-hydrates, are sold by their respective growers at a very different and much lower price than milk or peas, which are rich in albuminous elements. In every form nitrogen is always comparatively costly. The albumen in eggs, the fibrine in cereals, the casein in milk, and the legumin in peas and beans, all owe their importance and cost to this particular element, which is the source of force and vigour, of the labour of the hardest-worked cattle and men, of lean meat and muscle.

Considering the limited supply of nitrogen and the cost of obtaining it, it is not surprising that it should often be present in cultivated soils in quantities insufficient for a full crop, and that the land, when dressed with salts of nitrogen, should answer to their touch as a horse does to the spur. In the Rothamsted experiments the unmanured field yielded for years about fourteen bushels, or half a crop, till a dressing of nitrogen was given to it, when immediately the crop was doubled, nitrogen having been, as it often is in clay soils, the one thing needful to a full crop. Sir John Lawes has been sometimes asked by American farmers how to restore the exhausted fertility of their fields, so that the land, yielding fourteen bushels per acre, which is about the average of corn-exporting countries, might be induced to return twice as much. It is fortunate for English farmers that Sir John can only send advice into the far West; he cannot send nitrogen.

Some years ago the agricultural community was flattered by the immediate prospect of a never failing supply of nitrogen. The marvels of chemistry and analysis had recently been unfolded by the writings of Sir H. Davy and Baron Liebig, and the efficacy of guano had accustomed farmers to the new method of supplying nitrogen to the land in concentrated forms and from sources outside the farmyard. Then came the promise of obtaining nitrogen from the atmosphere. The agricultural classes are rarely much moved by anything but bad weather and falling prices, and the chemists had explained to them that the nitrogen of the atmosphere, existing as it does in a free state mixed with oxygen, was not available for agricultural purposes. If it could be induced, they were told, to enter into combination with hydrogen the result would be ammonia, an invaluable manure. This was understood by farmers, and a great sensation was occasioned among them when Mr. Nasmyth, the inventor of the steam hammer, proposed to control the supply of the most costly of plant constituents by knocking it out of the atmosphere. It is easy to see that if Mr. Nasmyth had succeeded in knocking nitrogen and hydrogen into combination at a moderate cost, a revolution in the price of manures and of food must have speedily occurred.

But as the plan failed and as plants still "live and move and have their being" in the midst of an element which they cannot feed on, it was certainly surprising to learn lately that nitrogenous manures had ceased to produce their accustomed effect. The phenomenon occurred at the Duke of Bedford's experimental farm at Woburn, where, according to official statements, the yield of wheat manured by the dung of animals fed on maize proved as abundant as the crop which followed from manure produced by the feeding of cotton cake, which enriches the excreta with far more nitrogen than that produced by feeding maize.

The Woburn experiments were instituted by the Royal Agricultural Society and were placed under the management of its chemist, the late Dr. Voelcker, for the purpose of testing the value of manure obtained by the consumption of different kinds of food and to compare the effects of such manures with those of artificial manures. It is evident that in such a comparison the land to which the various fertilisers were applied should have been of similar quality. But there are other disturbing causes which may vitiate experiments of this kind, and these were not at first generally recognised. The mistake occurred in some rotation experiments in which the manure derived from cotton cake containing about 40 per cent. of nitrogenous constituents was compared in its results with that obtained from maize, a cereal containing only 10 per cent. of albuminoids. The results of these experiments were known to the agricultural community before the report of Dr. John Voelcker, who has succeeded his late father as chemist to the Royal Agricultural Society, had been made, and much surprise was expressed that at the close of the second rotation the cotton cake had not shown any decided superiority over the maize. It has been recently explained in an official report on the "Objects, Plan, and Results of the Woburn Experiments," that this was "probably due to the large amount of unexhausted manure in the land." Before commencing experiments, therefore, on the comparative value of manures the land should be exhausted by repeated scourging crops, as at Rothamsted, where in some cases the deep-rooting Bokara clover has been grown for the special purpose of reducing the fertility of the soil to *nil*.

It has long since been established that nitrogen is neither absorbed by plants from the atmosphere nor conveyed into the soil to any appreciable extent in any way except by the direct application of manure: still there are some crops which collect nitrogen and leave the surface-soil richer than before. Red clover is usually grown as a preparation for wheat, and although clover hay must necessarily withdraw a great deal of plant-food from the soil, it does not prove exhaustive in practice because the deep and fleshy roots of the plant collect nitrogen from the subsoil and, in their decay, supply it to the growing wheat-crop. Under such circumstances a strong nitrogenous manure may not be required, and may perhaps prove less desirable than a weak manure containing less nitrogen. Enough has been said to show that the field experiments which are now becoming popular, and which are being instituted at many "stations" throughout the country, will require great care and the supervision of managers who possess a competent knowledge both of "practice and science."

H. E.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

LONDON.—In accordance with resolutions passed at the extraordinary meeting of the Convocation of the University of London held on July 28 last, an adjourned extraordinary meeting of the House was held on Tuesday week in the University Building, Burlington Gardens, which was very numerously attended. The Chairman of Convocation (Mr. F. J. Wood, LL.D.) presided, and in his opening address explained his ruling that under the said resolutions the business pending before the former meeting might now be proceeded with, and invited the House to resume the debate accordingly. At the time of the adjournment the House had a motion before it, made by Lord Justice Fry, for the reception and adoption of the report of the special committee appointed to consider the project of the "Association for Promoting a Teaching University for London." To this motion an amendment had been moved by Mr. J. W. Bone, seconded by Mr. Philip Magnus, omitting all the words in the original motion after the word "received." At Tuesday's meeting leave was given to Lord Justice Fry to accept the amendment, which thus became a substantive motion, to which his Lordship, however, immediately proposed to add "And that the House now consider what amendments, if any, ought to be made in the said scheme, and that such amendments, if any, be by way of instruction to a committee of revision." For Lord Justice Fry's motion 76 only voted against 122 who negatived it. Ultimately after a three hours' sitting the debate was adjourned to Tuesday, December 8.

ALDERMAN SIR R. N. FOWLER, BART., M.P., has consented to present the City and Guilds of London Institute's Scholarships, Prizes, and Certificates at a meeting to be held on Wednesday evening, December 9, at the Salters' Hall, St. Swithin's Lane, E.C. The Right Hon. the Lord Mayor will preside.

SCIENTIFIC SERIALS

Mittheilungen der Naturforschenden Gesellschaft in Bern, Nos. 1064 to 1091, 1883-4 (three parts).—Contributions to the doctrine of metal-poisoning, by J. Marti.—Terrestrial and fresh-water mollusca collected in the neighbourhood of Berne and Onterlacken, by G. Regelsperger.—An automatically-acting thermograph, by G. Hasler.—Influence of sexual excitation on the composition of cow's milk, by F. Schaffer.—Further paper on the animal world in the pile-dwellings of the Lake of Bienne, by Th. Studer.—On a parasite in the intestine of the horse, by M. Flesch.—On the nature of odorous matters and

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the causes of smell, by A. Valentin.—Mathematical considerations on the structure of bees' cells, by A. Jonquière.—On the inhibitory mechanism of the heart, by A. Glause.—On the separation of manganese and nickel by means of ozone, by V. Schwarzenbach.—On determinate integrals, by J. H. Graf.

SOCIETIES AND ACADEMIES

LONDON

Zoological Society, November 3.—Prof. W. H. Flower, F.R.S., President, in the chair.—Mr. Sclater exhibited the skull of a Tapir received by the Society in May, 1878, which was then described as *Tapirus roulini*, but which had since been found, upon anatomical examination, to be merely a dark variety of *Tapirus americanus*.—A letter was read from Mr. J. Caldwell, C M.Z.S., of Port Louis, Mauritius, announcing the finding of a new deposit of dodo-bones in a small cavern in the south-west part of the island.—An extract was read from a letter addressed to the Secretary by Dr. F. H. Bauer, C.M.Z.S., of Buitenzorg, Java, containing some notes on the Flying Lizard (*Ptychozoon homalocephalum*) of that island.—Prof. Bell exhibited and made remarks on a fine specimen of the Decapod Crustacean, *Alpheus megacheles*, obtained by Mr. Spencer at Herm, Channel Islands.—Mr. Martin Jacoby communicated the second portion of his paper on the Phytophagous Coleoptera of Japan obtained by Mr. George Lewis during his second journey, 1880–81. The present part treated of the Halticinæ and Galerucinæ of Mr. Lewis's collection.—Mr. A. G. Butler read a paper containing an account of two collections of Lepidotera recently received from Somali Land. Mr. Butler considered that the Lepidopterous fauna of Somali Land was essentially Arabian in character.—Mr. L. R. Lydekker, F.Z.S., described a last upper molar of a Mastodon, which had been obtained by Mr. A. H. Everett, C.M.Z.S., in Borneo, and referred it to a small race of *M. latidens*, previously known only from the Pliocene Siwaliks of India and Burmah. The specimen was of much interest, as increasing our knowledge of the eastern range of the Siwalik mammals.—Mr. W. T. Blanford, F.R.S., read a monograph of the genus *Paradoxurus*. After a critical examination of a large series of specimens Mr. Blanford came to the conclusion that it would be necessary to reduce the numerous so-called species of this genus to about ten well-marked forms.—Mr. W. T. Blanford, on behalf of Mr. J. A. Murray, read a paper containing the description of a new species of *Mus* from Sind, proposed to be called *Mus gleadowi*.—Mr. F. E. Beddard, F.Z.S., read an account of the specific characters and structure of some New Zealand earthworms of the genus *Acanthodrilus*.

PARIS

Academy of Sciences, November 2.—M. Bouley, President, in the chair.—The Perpetual Secretary announced the death of M. Joly, Corresponding Member of the Section for Anatomy and Zoology, who died at Toulouse on October 17, 1885.—Remarks on the subject of M. Hirn's recent experiments on the velocity of gases with a view to testing the truth of the kinetic theory of gases, by M. Faye. The author infers from the results of these experiments that the kinetic hypothesis will have to be reconsidered, if not absolutely rejected. The limit which it imposes on the velocity of gases under certain conditions of temperature and pressure is shown to be imaginary.—Fresh researches on the origin of the glandular nervous fibres and of the vaso-dilator nervous fibres which form part of the chord of the tympanum and of the glosso-pharyngian nerve, by M. Vulpian.—Remarks on M. H. Filhol's new work entitled "Recherches zoologiques, botaniques, et géologiques faites à l'île de Campbell et en Nouvelle-Zelande," by M. Alph. Milne-Edwards. The researches embodied in this work tend to show that since the Chalk or beginning of the Tertiary epoch Campbell Island can have formed no part of New Zealand or of any other Australasian region.—Solution of a question of indeterminate analysis constituting a fundamental principle in the theory of the Cremona transformations, by M. de Jonquières.—Experimental researches on the temperature observed in the mother at the moment of delivery and of the child at birth: comparison of these two temperatures, by M. Bonnal.—On the attenuation of the virus of ovine variola, by M. P. Pourquier. From his researches, continued for a period of seven or eight years on the principles established by M. Pasteur, the author concludes that it is possible to attenuate this virus, to transform it into a true vaccine, and thus avoid the serious losse hitherto incurred by inoculating sheep against the disease.—On the Cremona transformations in a plane of *n* order, by M. G. B. Guccia.—On the decomposition of quadratic forms, by M. Benoit.—Note on the theory of M. Helmholtz respecting the preservation of solar heat, by M. Ph. Gilbert.—Note on the doubly-refracted dispersion of quartz, by M. J. Macé de Lépinay.—On the theoric distribution of heat over the surface of the globe, by M. A. Angot.—Combination of the nitrate of silver with the alkaline nitrates (nitrates of potassa, rubidium, ammoniac, soda, and lithine), by M. A. Ditté.—On the anhydrous chloride and silicate of cerium, by M. P. Didier. Having already determined the action of hydrosulphuric acid on the anhydrous chloride of cerium, the author now communicates a process for preparing this substance, and describes some other compounds obtained by its means by the dry process.—Note on the Asteriadæ collected during the *Talisman* expedition, by M. Edm. Perrier. As many as fifty-four species, represented by nearly 200 specimens, were obtained on this occasion, some fished up from depths exceeding 4000 metres.—On the respiration of leaves in the dark: carbonic acid retained by them, second note, by MM. Dehérain and Maquenne.—Note on artificial earthy specular iron, by M. Stan. Meunier.—On the zymotic properties of charbon and septicemic blood, by M. A. Sanson.—On the transmission of virulent glanders to the pig, by MM. Cadéac and Malet.—Treatment of mildew in the vine by means of the sulphate of copper, by M. A. Müntz.—The sulphate of lye-ashes and its employment against animal and vegetable parasitic diseases, by M. Duponchel.—Account of a remarkable meteoric phenomenon observed at Pondicherry on June 13, 1885, by M. C. André.

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